THE SUN AS A MAGNETIC ROTATOR

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Severny (1969) used a technique which enables the Sun to be observed like a magnetic star. Because of rotation, different sides of the Sun are visible at different times. A curve of variable magnetic field is obtained. During nearly three periods of rotation the Sun appears to be a quadrupole magnetic rotator. Generally, the integrated field of sunspots seems to be opposite to the field of the Sun as a whole. The curve seemed to remain similar throughout the year 1968.

This observed phenomenon can be explained in the following way:

Magnetic flux through the leading part of a bipolar magnetic region, or bipolar group, must be equal (but of opposite polarity) to that through the following part. The following part disintegrates much faster than the leading one, which means that the field of the following part is distributed over a large area. When the magnetic field of the Sun as a whole is observed, the fields of the spots affect the result less, because their temperature is lower than that of the photosphere and their area smaller. Therefore the disintegrated following parts have a greater influence on the observed large scale fields. In the field of the spots the leaders are the more important.

The long life-time of the large scale magnetic regions can be explained on the basis of the phenomenon that new spot groups have a tendency to develop in close proximity to the places where spots already appeared. The phenomenon seems to continue for years, which means that the Sun will have long-lasting large-scale magnetic regions.

References

Severny, A.: 1969, *Nature* **224**, 53.
Tuominen, J.: 1962, *Z. Astrophys.* **55**, 110.
Tuominen, J.: 1970, *Nature* **228**, 1179. The above text is a summary of this article.

Discussion

Wilcox: Your discussion conserves magnetic flux in a bipolar magnetic region, the same flux coming out of one part of the region and going into the other part. As a discussion of Prof. Severny's results it is incomplete because there is no discussion of the net photospheric lines of one polarity that go out to form interplanetary magnetic sector patterns.

Howard (ed.), Solar Magnetic Fields, 754.